

Date/Time: January 30, 2015

School/District/Grade/Subject: 7th Grade Math

Lesson Purpose: Students will review how to solve algebraic equations by balancing both sides using manipulatives and picture problems.

Lesson Objective: *The student will be able to*

Lesson Standard:

- **7.EE.A.1:** *apply properties of operations as strategies to add, subtract, factor, and expand linear equations with rational coefficients.*
- **7.EE.A.2:** *Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities are related to it.*
- **7.EE.B.4.a:** *solve word problems leading to equations of the form $px + q = r$ where p , q , and r are specific rational numbers. Solve equations of these forms fluently.*

Grouping/Arrangements: Students will be in the resource room completing a reinforcement lesson. There will be 5 students present.

- **Coin and package worksheets**
- **Algebraic tiles/manipulatives**
- **Dry erase board**
- **Dry erase markers**

Launch: *The teacher will explain to the students that they will practice first solving algebraic equations using the algebra tiles so that they understand exactly what is going on in the problem. Then, they will practice only using numbers and variables to solve the problems.*

1. **Instructional Activities:** The teacher will give each student (six students) a group of algebra sticks and small algebra tiles. In these problems, the sticks will represent the “packets” and the small square tiles will represent the coins. The teacher and the students will set up the first problem together:

Teacher: you will notice that in the first problem, there are how many coins on the left side of the equation?

Student 1: There are 5, I mean 10.

Teacher: Great! If there are 10 coins on that left side we need to find ten small square tiles to represent those 10 coins and place them in a pile.

Teacher: now that everyone has their coins on the left side of the equation, we have to look at the right side of our equation. On your paper, you want to put a pencil where the “Equal sign” is. This way, your left side will be split up from your right side! Excellent! It looks like everyone has put his or her pencil in for the equal sign. Now, let’s look at the right side of the equation. How many packets or pouches do we have on the right side?

Student 2: 3

Teacher: Fabulous. How many coins?

Student 4: 4 coins.

Teacher: Okay. (Teacher will model finding three sticks for her pouches and 4 small squares to represent her coins.)

Teacher: Now that our equation is all set up, we need to look at both sides of our equation. Do we have pouches on both sides?

Student 2: No. We only have coins.

Teacher: exactly! We only have coins on both sides. How many coins can we take away evenly from both sides?

Students: 4 coins.

Teacher: Okay so let’s take four coins away from both sides of our equation.

(Teacher will model and then the students will complete this step on their own)

Teacher: Now we have 6 coins on the left side and three pouches on the right side. We want to know how many coins can fit into one pouch, so let’s put our three pouches out and then divide up the coins. The teacher will model: This pouch gets one coin, this pouch gets one coin, this pouch gets one coin. The Teacher will continue to divide up the coins until all the coins are gone. In this problem, every pouch got how many coins?

Student 3: Every pouch has two coins each!

Teacher: Great. So in our box next to that picture we can put the number 2 because the number of coins in each bag is 2. Now, it asks us to write an equation based off of the original problem. Everyone look at the original problem on their worksheet. How many coins did we have on the left side again?

Student: 6: 10.

Teacher: okay so let’s start with the number $10 =$ now how many pouches do we have on the right side?

Student: 5: 3.

Teacher: Okay so now our equation reads $10 = 3p$ p stands for pouches. Is this the end of our equation or am I missing something else?

Student 4: you are missing the coins on that side. We also have 4 coins.

Teacher: Okay, good. We need to add in our 4 coins so our equation now reads $10 = 3p + 4$ This is our equation! It is that easy!

During the remainder of this lesson, the teacher constantly walked around the classroom to ensure that all 6 students understood the steps needed to complete these algebraic problems. Below is a table with a list of accommodations/modification/adaptations used for each student in the classroom.

MK: 2nd problem modeled with the teacher to ensure that the student understood the steps using the algebra tiles. Student needed to be prompted to think about what was the SAME on both sides. Could you take away pouches? No because the right side of the equation does not have pouches. The teacher also prompted the student to make sure that she was carefully counting when setting up the problem.

SD: This particular student had a difficult time getting started on the subsequent problems. On problem number two, he tried to remove pouches from one side. However, the teacher reminded him that what is removed from one side must be removed from the other side. If there is only pouches on one side, they cannot be taken away. The rules "what you do on one side of the equation is what you do on the other side of the equation" was written on a white board next to the student so that he would remember this rule.

BR: This student had an easier time setting up the problem and removing the tiles accordingly. However, she had a difficult time looking at the original equation and writing something that made sense. The teacher modeled the second problem for the student and explained that she was simply writing down the numbers that represented the picture. In problem number 2 there were 2 pouches so we would write $2p + 4$ because there are also 4 coins. On the right side, there are only coins so all we have to do is write the numbers of coins available. This student was quickly able to master this worksheet. Thus, after she was finished, she was instructed to solve the equations only using numbers and variables. The first problem was modeled by the teacher and the subsequent problems were completed independently.

VT: This student originally had a very difficult time understanding this concept/wanting to complete the problems. The second teacher in the room pulled him out in the hallway to talk to him a little bit about his behavior. Afterwards, he was more focused and able to work better in the classroom. This student needed a lot of help writing the equation. The teacher gave him a modeled problem to put in front of him while he was working to remind him of the steps needed to write the equation.

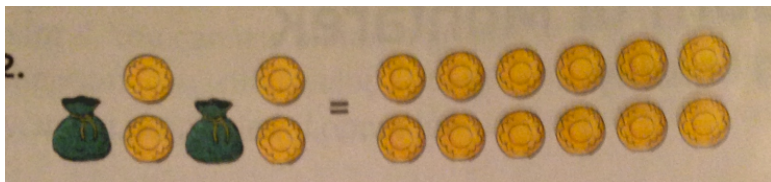
MA: This student works best with manipulatives and pictures. While the other students eventually moved on to problems without pictures, this student continued to complete three extra problems with pictures to make sure that he understood the principles behind the algebraic thinking.

It is important to note that this lesson was taken from the original "Moving Straight Ahead" Linear Relationship book. However, the teacher copied the pictures used in the book onto a separate worksheet that was more concrete and easier to understand/access the information. Algebraic tiles were also used to model the equations used in the book so that the students would be able to use them to make sense of the problem. I found that the manipulatives were extremely useful in getting the students to understand the concept behind "balancing" the equations. All of my students were extremely successful during this lesson and the levels of frustration were kept to a minimum. The last three problems we completed in class (without the pictures) were more challenging. However, the teacher prompted the students with many questions that helped to scaffold the material appropriately.



Number of coins in each bag: _____

Write equation _____



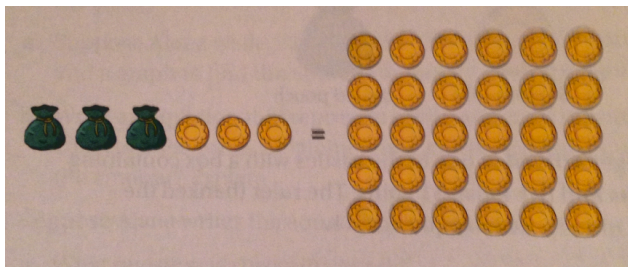
Number of coins in each bag: _____

Write equation _____



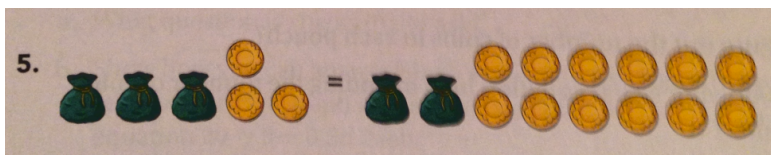
Number of coins in each bag: _____

Write equation _____



Number of coins in each bag: _____

Write equation _____



Number of coins in each bag: _____

Write equation _____

Lesson Conclusion:

The teacher concluded the lesson by having the students solve three problems on the white board. These problems were more challenging because they only had numbers. However, it seemed that many of the students were able to understand that what they were doing was the same process they were doing with the algebraic tiles. Now, instead of pictures of coins and pouches, there were numbers.